Comments on the Cost and Design of Smart Meter Texas

PUC Project: 42786

By: Awesome Power Inc.

34

Table of Contents

We are submitting these comments to make two points. First, Smart Meter Texas (SMT) is very poorly designed, has major flaws, and is badly broken. Second, the cost of SMT is egregious and unjustifiable.

The Joint TDUs estimate that the cost of SMT is $9.8 million per year. The graphic user interface (GUI) alone costs $3.65 million per year. There is no rational basis for these costs. Part I of this report highlights all of the clear problems with SMT, and compares this with the stated costs, to prove how unjustifiable these costs are. Part II of this report outlines a better design for SMT, one that would drastically improve functionality at a lower annual cost.

I. The State of SMT

According to "Overview of Smart Meter Texas 2014", SMT serves a number of purposes. The primary function, according to this document, is to provide customers, the customer's REP, and authorized third parties with access to the customer's smart meter data. To do so, SMT has to perform a number of intermediate roles. First, on a daily basis SMT receives interval data from the TDUs. Second, SMT must provide various user interfaces (the GUI, FTPS, and the API). Third, SMT must provide a process for third party access. Fourth, SMT must provide for HAN functionality (i.e. the ability to connect and disconnect in-home devices and transmit information to those devices).

In this section, we cover the second and third requirements that SMT has to satisfy so as to demonstrate that these functions are being performed very poorly. We return to the first and fourth point in the following section when discussing a better system for SMT.

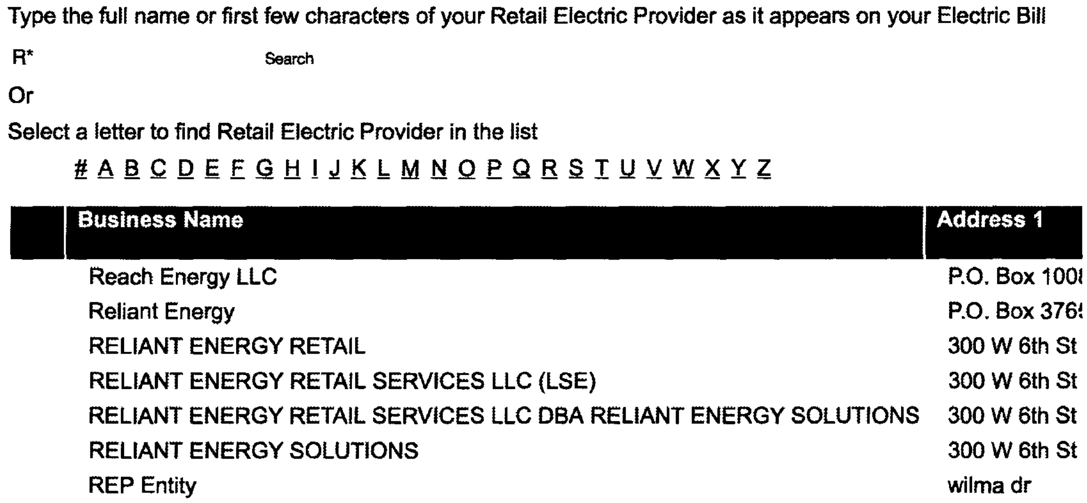
A. User Interface: Registration

According to the cost breakdown given by the Joint TDUs, the GUI alone costs $3.65 million per year. As such, it is important to see what people are getting for that amount of money.

i. Registration: Choosing Your Provider

In order to create an account on Smart Meter Texas, a user must have three pieces of information: his or her ESIID, meter number, and the name of his or her current REP. It should be noted from the outset that this is not an especially secure system. ESIIDs are public, meter numbers appear on your meter, often on the side of your house. As for your current REP, a user can simply guess multiple REPs: we have found no limit on the number of registration attempts allowed. In other words, if I want to spy on my neighbor's 15-minute usage data, I can easily do so provided my neighbor does not have an account on SMT.

There is also unnecessary confusion in the process. If your retail provider is Reliant, you are told that you can click the R and then you will see Reliant. However, you actually are given five "Reliants" to choose from, and only one will work.



Type the full name or first few characters of your Retail Electric Provider as it appears on your Electric Bill

R* Search

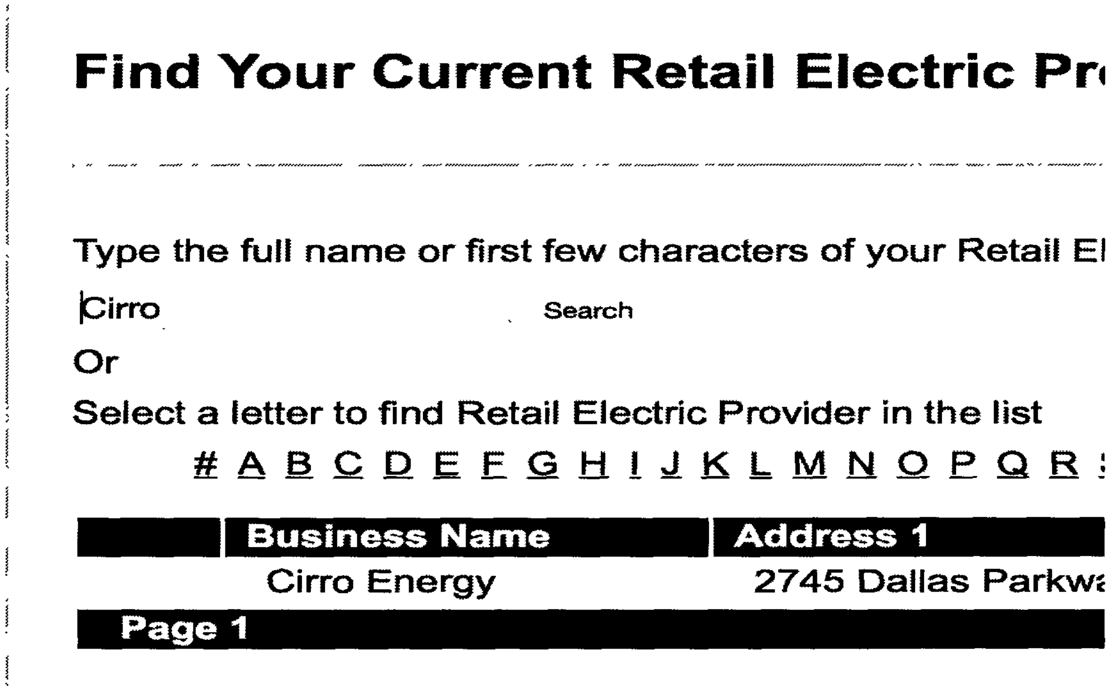
Or

Select a letter to find Retail Electric Provider in the list

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

	Business Name	Address 1
	Reach Energy LLC	P.O. Box 100
	Reliant Energy	P.O. Box 376
	RELIANT ENERGY RETAIL	300 W 6th St
	RELIANT ENERGY RETAIL SERVICES LLC (LSE)	300 W 6th St
	RELIANT ENERGY RETAIL SERVICES LLC DBA RELIANT ENERGY SOLUTIONS	300 W 6th St
	RELIANT ENERGY SOLUTIONS	300 W 6th St
	REP Entity	wilma dr

This is hardly a well-designed system worth $3.65 million per year. It actually gets worse, however. If your provider is, say, Cirro Energy, then you actually have to select US Retailers LLC. Of course, Cirro does appear, so a user has no real way of knowing this:



Find Your Current Retail Electric Pr

Type the full name or first few characters of your Retail El

Cirro Search

Or

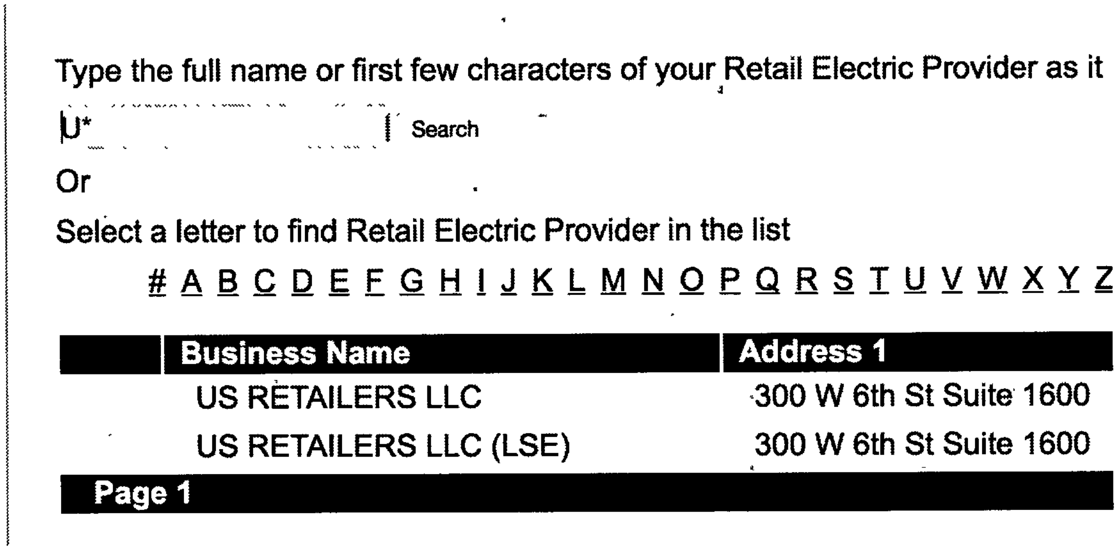
Select a letter to find Retail Electric Provider in the list

A B C D E F G H I J K L M N O P Q R

	Business Name	Address 1
	Cirro Energy	2745 Dallas Parkw

Page 1

And, if you want to select US Retailers LLC, you still have to pick between these two:



Type the full name or first few characters of your Retail Electric Provider as it

U* Search

Or

Select a letter to find Retail Electric Provider in the list

# A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

	Business Name	Address 1
	US RETAILERS LLC	300 W 6th St Suite 1600
	US RETAILERS LLC (LSE)	300 W 6th St Suite 1600

Page 1

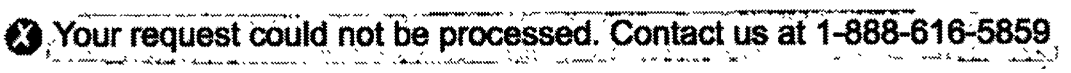
This is not especially hard to fix, but SMT has done nothing about it.

ii. Registration: Error Messages

When a client to server request results in an error, good web development practice is to return a 4XX client error with some useful information. SMT, in contrast, returns a 200 response (i.e. an OK response, which is what you get on a site when everything is functioning properly), along with no useful information.

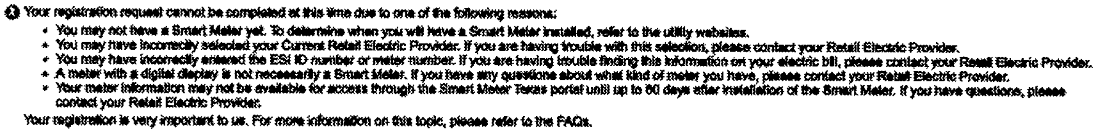
By way of example, if you try to register an account but your meter is already registered, SMT returns the following error message (as a 200 OK response): "Smart Meter is unavailable. Please contact your Retail Electric Provider if you believe this is an error." That doesn't tell the user that the meter is already registered to an account, even though that is what the problem is.

There are other equally unhelpful error messages.



Your request could not be processed. Contact us at 1-888-616-5859

This, I believe, occurs when the user provides a valid ESIID, meter number, and REP, but the ESIID and meter number do not correspond to one another. This is different from the generic error, which is:



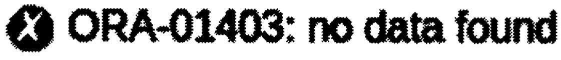
Your registration request cannot be completed at this time due to one of the following reasons:

- You may not have a Smart Meter yet. To determine when you will have a Smart Meter installed, refer to the utility websites.
- You may have incorrectly selected your Current Retail Electric Provider. If you are having trouble with this selection, please contact your Retail Electric Provider.
- You may have incorrectly entered the ESI ID number or meter number. If you are having trouble finding this information on your electric bill, please contact your Retail Electric Provider.
- A meter with a digital display is not necessarily a Smart Meter. If you have any questions about what kind of meter you have, please contact your Retail Electric Provider.
- Your meter information may not be available for access through the Smart Meter Texas portal until up to 60 days after installation of the Smart Meter. If you have questions, please contact your Retail Electric Provider.

Your registration is very important to us. For more information on this topic, please refer to the FAQs.

This does not make any sense. If a user types in the wrong meter number, but that meter happens to be a valid meter number for someone else, why does it not give the same error message that it would if the meter number was simply incorrect?

There are also some error messages that we still do not understand. Like this one, which is completely useless:



ORA-01403: no data found

Good web developers return 4XX errors, and they do not write error messages like this.

iii. Registration: Temporary Passwords

If a user does manage to submit a registration request, the user will then receive an email with a link to follow. That link uses a temporary password, and the user is then prompted to enter a new password along with a security question.

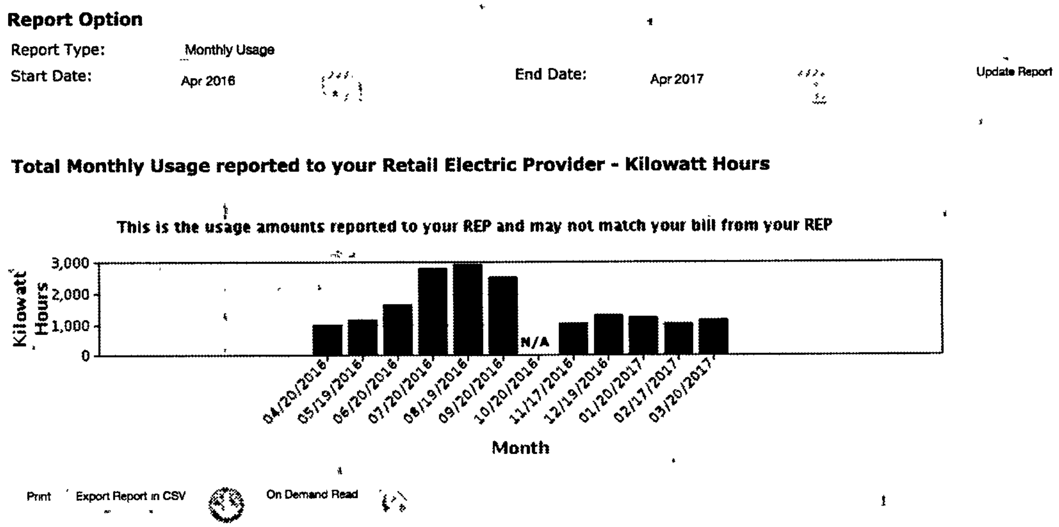
There is no reason for this. It is an unnecessary step, offers no security benefits, and is confusing. If you want to confirm that the person who registered the account has control of that email address, the proper way to do so is to send a "confirm email" email and keep the account restricted until the email is confirmed. The current system would allow a person who intercepts the email to access the Smart Meter Texas account, as the password and security question have not yet been set.

B. User Interface: Accessing Usage Data

The user interface is designed primarily to allow parties to access electricity usage data. SMT does a horrible job of providing convenient access to data, however.

i. Accessing Usage Data: Requesting Data on the Web Portal

SMT is not a particularly intuitive website. I just tried to access my monthly usage data, but the page got stuck loading for roughly two full minutes. Once the page did load, this is what was displayed:



Report Option

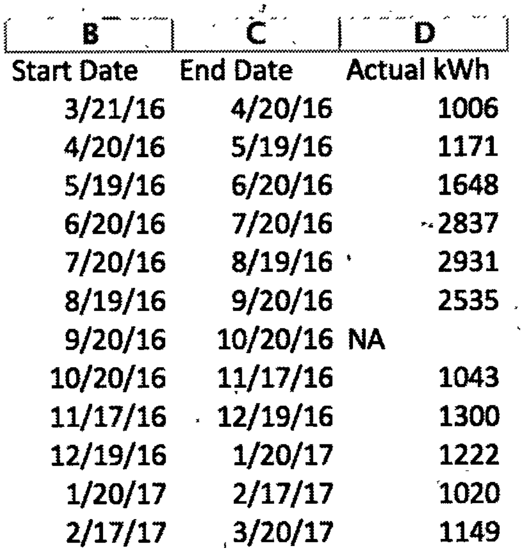
Report Type: Monthly Usage

Start Date: Apr 2016 End Date: Apr 2017 Update Report

Total Monthly Usage reported to your Retail Electric Provider - Kilowatt Hours

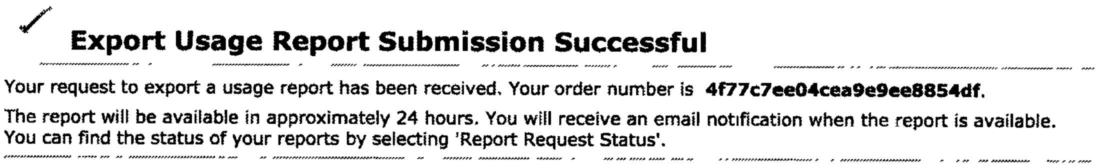
This is the usage amounts reported to your REP and may not match your bill from your REP

What do these buttons do? If you click the green button, nothing happens. It seems the green button is meant to refer to the "Export Report in CSV" button to the left. This is fairly confusing. If you click "Export Report in CSV", a CSV is downloaded to your browser. It looks like this:



B	C	D
Start Date	End Date	Actual kWh
3/21/16	4/20/16	1006
4/20/16	5/19/16	1171
5/19/16	6/20/16	1648
6/20/16	7/20/16	2837
7/20/16	8/19/16	2931
8/19/16	9/20/16	2535
9/20/16	10/20/16	NA
10/20/16	11/17/16	1043
11/17/16	12/19/16	1300
12/19/16	1/20/17	1222
1/20/17	2/17/17	1020
2/17/17	3/20/17	1149

But the "Update Report" button actually does different things in different situations. If you are viewing your monthly usage, "Update Report" will update the page to show the date range requested. If you are viewing your 15-minute interval usage, however, "Update Report" will bring you to this page:



✓ **Export Usage Report Submission Successful**

Your request to export a usage report has been received. Your order number is **4f77c7ee04cea9e9ee8854df.**

The report will be available in approximately 24 hours. You will receive an email notification when the report is available. You can find the status of your reports by selecting 'Report Request Status'.

You will then receive an email (within 24 hours) with a CSV file containing the data requested. But remember, that button does not even request CSV data when viewing monthly usage. So why does the button return CSV data when viewing 15-minute usage? This makes no sense.

ii. Accessing Usage Data: Delivery Mechanism and Delays

Aside from the confusing interface, the core functionality of how the website delivers usage data to a user is bizarre. As explained above, if it is only monthly data being requested, the CSV is sent directly to the client making the request. For 15-minute interval data, however, the CSV is sent as an attachment in an email. This file is only 2.7MB, so there is no reason it could not be sent to the client making the request, as is done with monthly data.

The reason for this difference is probably that SMT's servers are slow, and get backlogged regularly. Roughly once per week, requests for usage data will be delayed for hours. Here are some recent examples of this (we notified PUC each time):
April 6th, 2017: Usage reports delayed for multiple hours.
April 12th, 2017: Usage reports delayed for multiple hours.
April 19th, 2017: Usage reports delayed for roughly one hour.

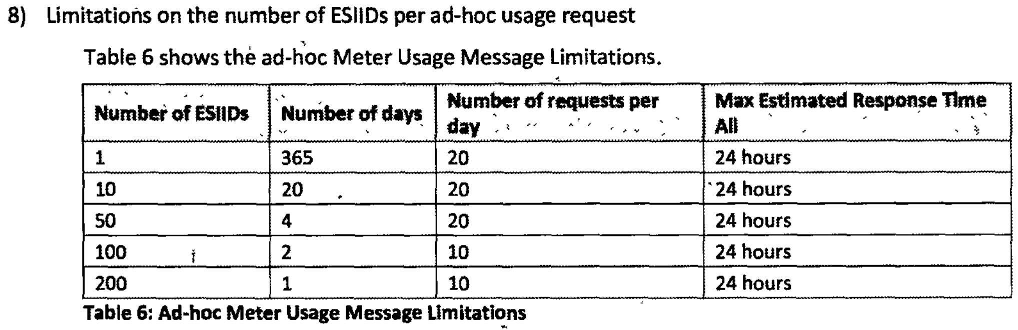
On the 6th of April, I received a call from Dave Hopkins, head of infrastructure at SMT, who told me that this is not a problem, because there is a queue that our requests must wait in. This, he said, is normal behavior. Of course, queuing is necessary if a server is handling more requests than can be processed concurrently. With that said, to cause an hour-long delay must mean that SMT was experiencing an ungodly high number of requests for data. We have not been given detailed information on the number of requests made on these days, but we have been told that making 600 requests in a single day would potentially cause a system-wide failure (i.e. more than simply a long delay).

This is unjustifiable. Ten thousand requests, each returning roughly 3MB of data, should not take more than a few minutes. In addition, handling these requests should not cost more than a few hundred dollars per month. Instead, SMT claims that access to usage data alone (not storing data, maintaining accounts, or anything else) costs $620,000 per year.

iii. Accessing Usage Data: API and FTPS

Not everyone uses the web portal. Instead, most REPs and third parties use SMT's API with FTP connectivity to access a person's electricity usage data. However, the API leaves a lot to be desired.

First, SMT does not even have a REST API. The API is a SOAP API instead, which there is little justification for. The API has a fairly involved "onboarding process", and the documentation is badly out of date. In fact, a lot of the API documentation simply makes claims that aren't true. By way of example, here are the listed rate limits:



8) Limitations on the number of ESIIDs per ad-hoc usage request

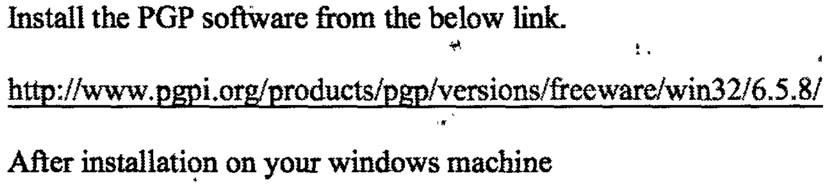
Table 6 shows the ad-hoc Meter Usage Message Limitations.

Number of ESIIDs	Number of days	Number of requests per day	Max Estimated Response Time All
1	365	20	24 hours
10	20	20	24 hours
50	4	20	24 hours
100	2	10	24 hours
200	1	10	24 hours

Table 6: Ad-hoc Meter Usage Message Limitations

We later found out, however, that this is not true. SMT does allow more than 20 requests for 12 months of 15-minute interval data per day. Of course, it is good that the documentation is incorrect. If the rate limit were 20 requests per day, it would be practically useless. At the same time, what is not incorrect is the estimated response time: according to SMT, the API is working properly provided the data is returned within 24 hours.

The instructions provided to get API and FTP connectivity are badly out of date, to the point of being useless. The instructions to generate a PGP Key start by saying:

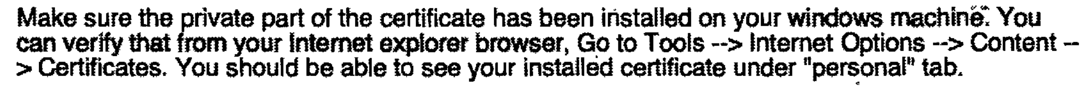


Install the PGP software from the below link.

http://www.pgpi.org/products/pgp/versions/freeware/win32/6.5.8/

After installation on your windows machine

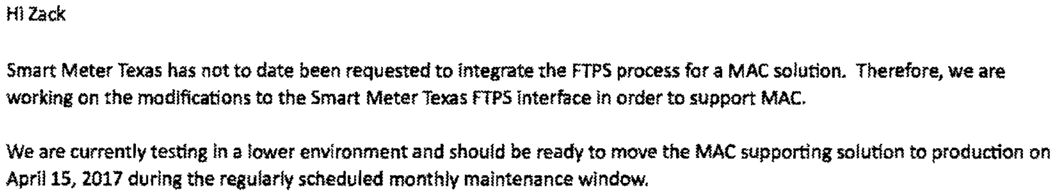
The URL provided does not link to a PGP software downloaded (or at least, it did not at the time of writing this). In addition, the instructions are only written for Windows users. This, it turns out, is a common theme. The FTP instructions read:



Make sure the private part of the certificate has been installed on your windows machine. You can verify that from your Internet explorer browser, Go to Tools --> Internet Options --> Content --> Certificates. You should be able to see your installed certificate under "personal" tab.

So, a user needs a "Windows machine" and "Internet Explorer".

But this is not merely a problem with the onboarding instructions and documentation. It turns out, API and FTP access only works on Windows. Here is an email I received from SMT confirming this to be the case:



Hi Zack

Smart Meter Texas has not to date been requested to integrate the FTPS process for a MAC solution. Therefore, we are working on the modifications to the Smart Meter Texas FTPS interface in order to support MAC.

We are currently testing in a lower environment and should be ready to move the MAC supporting solution to production on April 15, 2017 during the regularly scheduled monthly maintenance window.

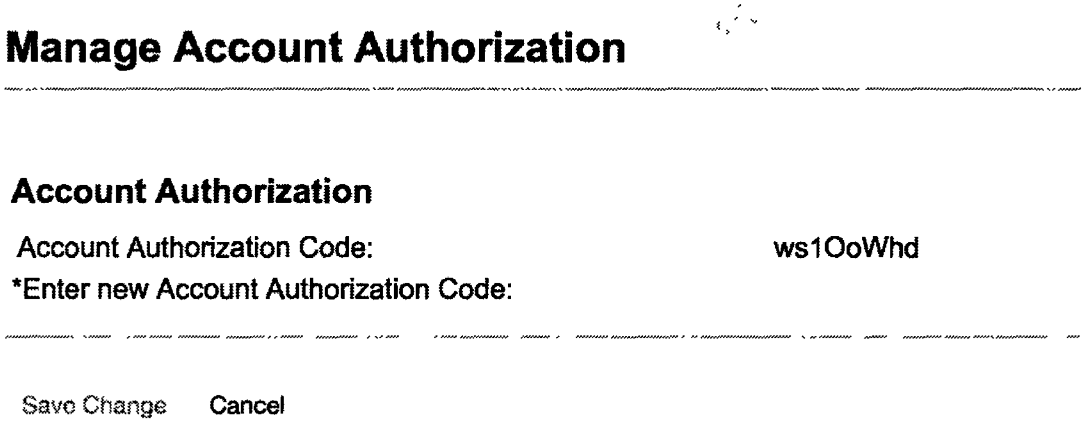
In case it is hard to read, the first two sentences say, "Smart Meter Texas has not to date been requested to integrate the FTPS process for a MAC solution. Therefore, we are working on the modifications to the Smart Meter Texas FTPS interface in order to support MAC." In other words, the entire FTP system at SMT is specific to Windows.

C. Third Party Data Access

In addition to providing a user interface, another necessary function of SMT is providing for third party data access. This is an area that has been discussed for a few years now, and yet it is still truly substandard. Most of the problems mentioned above have knock-on effects for third parties. This subsection focuses only on the problematic aspects of SMT unique to third parties

i. Third Party Access: Authorization Process

The process by which a user gives access to a third party (the "authorization process") is very poorly designed. Currently, a person who has an account on Smart Meter Texas must go to the "Account Profile" tab, and then click "Manage Account Authorization". After doing so, this appears:



Manage Account Authorization

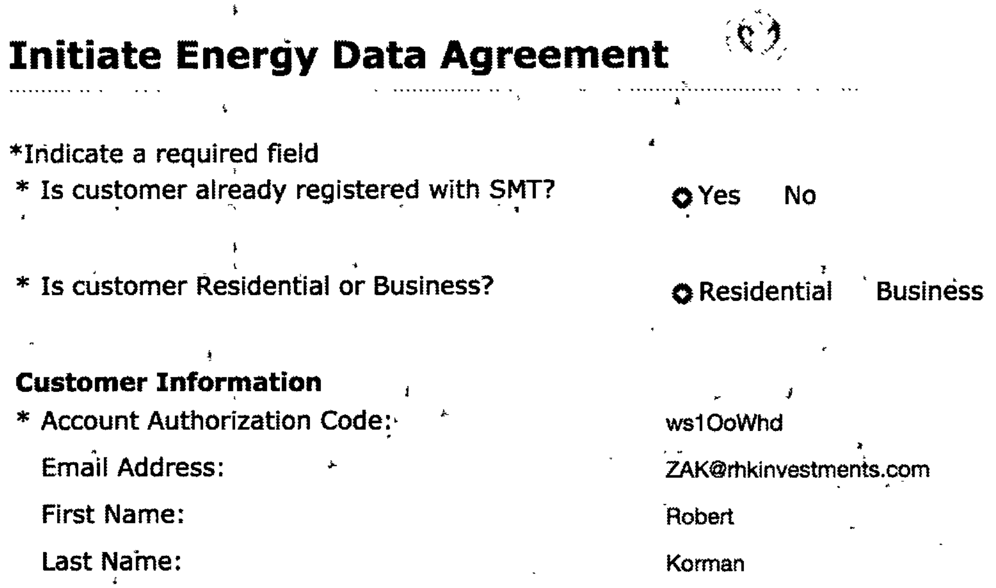
Account Authorization

Account Authorization Code: ws1OoWhd

*Enter new Account Authorization Code:

In other words, the only place where a user can find his or her Account Authorization Code (AAC) is the place where he or she would change it. The user experience here is very poor.

After a user has his or her AAC, it is necessary to provide it to the third party. The third party can then send a third party agreement invite to the user by filling out a form on SMT. By inputting the AAC, the information is automatically filled out:

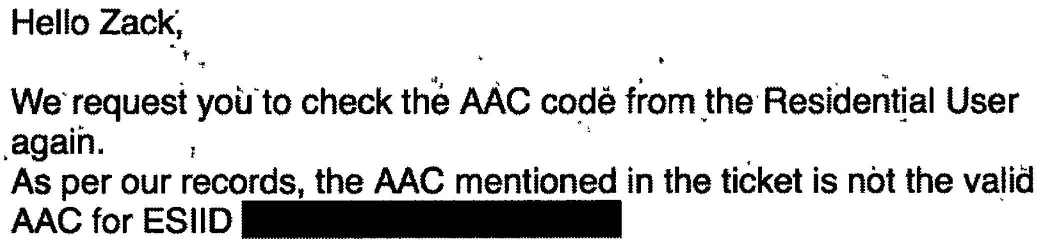


Initiate Energy Data Agreement

*Indicate a required field

* Is customer already registered with SMT?	● Yes No
* Is customer Residential or Business?	● Residential Business
Customer Information	
* Account Authorization Code:	ws1OoWhd
Email Address:	ZAK@rhkinvestments.com
First Name:	Robert
Last Name:	Korman

At least, it is supposed to be automatically filled out. There have been cases, however, where this simply does not work. I have no idea why that is the case, but it has definitely happened before. Even having the user change the AAC does not fix the problem. In addition, SMT does not understand the problem either. Once I notified SMT of this, I received the following email:



Hello Zack,

We request you to check the AAC code from the Residential User again.
As per our records, the AAC mentioned in the ticket is not the valid AAC for ESIID [redacted]

The problem with this explanation is that the AAC should fill in the relevant information, independent of whether the ESIID is entered correctly. In fact, this occurs before the form ever asks for the ESIID. In other words, this answer makes no sense. This problem still occurs from time to time, and as far as I can tell SMT is still equally oblivious to it.

But if an agreement is sent successfully, the user will then receive an email. The user can then click "Accept" or "Decline" on the agreement. If the user clicks accept, the user is then brought to SMT and is asked to log in. Once the user logs in, the agreement is accepted.

This is very poorly thought out. Once the user gives the third party the AAC, why does the user still have to receive an email and re-confirm that he or she wants to enter into the agreement? This is redundant, and in practice is a massive pain. A user visits a third party's website, then has to go to SMT to get an AAC, then goes back to the third party's site to provide the AAC, then goes to his or her email, then goes back to SMT again. This is horrible user experience.

However, the system for third party access is actually much worse, because frequently it just stops working entirely. Here is a list of such failures (we notified PUC each time):

- January 17th, 2017: Third party agreement invites are not sending.
- January 19th, 2017: Third party agreement invites are not sending, resolved six hours later, but then the problem occurs again and is not fixed for three to four more hours.
- January 24th, 2017: Third party agreement invites are not sending. This problem continued, more or less, for two full days.
- February 21st, 2017: Third party agreement invites are sending, but they contain broken links that do not work. This problem continued for two full days.
- March 1st, 2017: SMT completely crashes for hours, and no one can log in.
- March 14th, 2017: SMT completely crashes again, and no one can log in.
- March 20th, 2017: Just like February 21st, third party agreement invites are sending with broken links (rendering them useless).
- March 28th, 2017: Registration of new users stops working completely.
- March 30th, 2017: SMT completely crashes for hours, and no one can log in.

As is apparent, SMT crashes a lot, and the third party authorization process is very buggy.

Remember, the primary function of SMT is to provide customers, the customer's REP, and authorized third parties with access to the customer's smart meter data. With such a horribly designed third party access system, along with such frequent crashes and failures, it is clear that SMT fails to provide this function effectively.

ii. Third Party Access: Lack of Use

Given the above information, it is no surprise that so few people actually use SMT. This is especially true when it comes to third parties. As of February 1st, there were fewer than 1,000 active third party agreements on SMT. Since that time, the number has increased by a few thousand, but that is only because of our website, https://www.awesomepowertexas.com/.

What is interesting about this, however, is that the Joint TDUs claim (before we even came around) that the cost of data warehousing third party agreements is $615,000 annually, in addition to the $766,000 annual cost of providing third party functionality. That is nearly $1.4 million a year for third party agreements when there were fewer than 1,000 agreements in the entire state. This is a truly unjustifiable waste of money.

D. Other Miscellaneous Issues

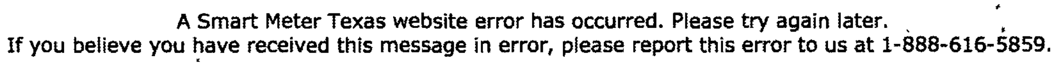
The truth is that nothing on SMT could be described as "good". At best, it does its job, and in most cases it does not. This section discusses some of the usability problems with SMT.

i. Miscellaneous: User Sessions

One annoying aspect of SMT is that if you are logged in and press the back button, SMT logs you out. The documentation for SMT actually claims this is a security feature. It isn't. It's horrible web design, and a failure to manage user sessions properly. Notice, for example, that good websites, like Facebook, do not do this.

ii. Miscellaneous: Terminating Third Party Agreements

If a third party logs onto SMT, finds a third party agreement, and terminates it, the following error message appears:

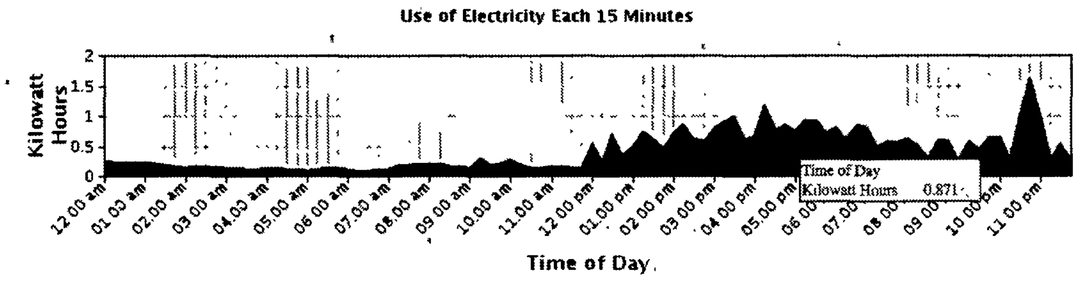


A Smart Meter Texas website error has occurred. Please try again later.
If you believe you have received this message in error, please report this error to us at 1-888-616-5859.

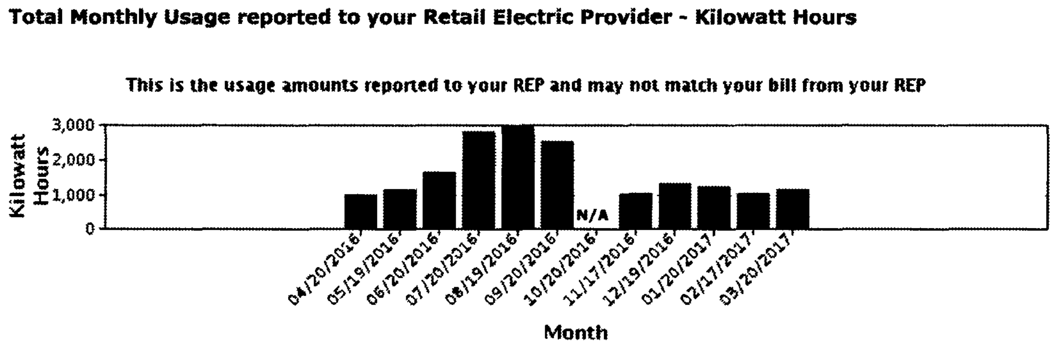
This is, I assume, because it is now impossible to view the agreement that was terminated. However, any decent system would actually provide a message confirming the agreement has been terminated.

iii. Miscellaneous: Usage Graph

This is the graph that users see on Smart Meter Texas, which is intended to display usage information:



It isn't very good. It is too wide, and not tall enough. The time of day is blank unless the cursor is at a one-hour interval mark. There is no pointer that shows what point in the data is being displayed. If your mouse is over the data, rather than in the blue region, the data box does not appear. It just isn't very good. And, if you want to see your monthly usage, the graph changes to look like this:


Total Monthly Usage reported to your Retail Electric Provider - Kilowatt Hours

This is the usage amounts reported to your REP and may not match your bill from your REP

All of the data is suddenly compressed in the middle of the graph, but the x-axis remains all the way to the side.

iv. Miscellaneous: Inconsistent Access Timeframe

As an individual, you can access up to 13 months of 15-minute interval usage data. This means that a user can request a full year of data. However, as a third party it is only possible to get 12 months of data. This makes it impossible to get a full year of data. It is necessary to request 12 months of data minus one day. There is no reason for SMT to work like this, and it is very annoying.

v. Miscellaneous: Unique Emails

When creating an account, you cannot use the same email address if it is already used for a different account. You also cannot change your email to use an email that is already being used by a different account. There is no good reason for this.

vi. Miscellaneous: Password Characters

Passwords only can use alphanumeric characters, along with a few symbols I believe. Many symbol types are disallowed. This makes passwords less secure, and is completely unjustifiable.

II. Redesigning SMT

There are hundreds of problems with SMT, and the above information only scratches the surface. Hopefully, however, it is apparent that for millions of dollars per year SMT should be far better than it is. Recall that the primary function of SMT is to provide customers, the customer's REP, and authorized third parties secure access to the customer's smart meter data. It is possible to perform this function far better than SMT currently does, and do so for a fraction of the cost.

In this section we present an outline of how we would redesign SMT to make it both better and cheaper. This section should not be read as a definitive proposal, but rather as an outline given what we know about the required functionality of SMT. With that said, this section is nonetheless meant to be taken seriously. We are confident that we could redesign SMT to make it radically better while reducing the cost.

A. Data Storage

The report from the Joint TDUs claims an estimated data warehousing cost of $6.15 million per year. In informal discussions with PUC, it is clear that PUC believes this cost is somehow rationally related to the amount of data being stored. It quite clearly is not. If we are to take the Joint TDUs' cost breakdown seriously, the cost of storing fewer than 1,000 third party agreements is $615,000 per year. That, however, is so obviously absurd that it presumably is not meant to be taken literally. As such, we will focus on providing a total cost figure for storing and handling all of the data SMT is required to maintain.

First and foremost is the storage of electricity usage data. Being conservative, there are roughly 7 million smart meters, and for each meter SMT is expected to store 7 years of data. Each year of data is roughly 3MB. In total, this means that SMT is storing roughly 150TB of data. How much should this cost? Amazon Redshift, "a fast, full managed data warehouse", costs roughly $1,000 per TB per year. All data is stored in an encrypted manner, and Amazon Redshift supports SSL-enabled connections between the client application and the data warehouse. Backups are generated automatically on a daily basis. In short, Redshift is an excellent solution for SMT's data storage purposes, and would only cost $150,000 per year. This includes the cost of the processing power needed to query the data.

In addition, by storing the data in an efficient manner, it seems likely that the size of the data can be reduced dramatically. By way of example, the 3MB figure above is simply the size of the CSV file returned from a request for 12 months of 15-minute usage data. By deleting the ESIID column (i.e. not storing the ESIID number 36,000 times per year of usage data), the file size is reduced by 50%. In other words, the cost above could be reduced to $75,000 per year. There are likely more opportunities for file size reduction, and therefore cost savings.

B. User Registration

The current registration system is bulky and pseudo-secure. Anyone can create an account for an address by reading the smart meter directly from the physical meter (which resides on the exterior of the building) and guessing REP for that address (with unlimited chances to guess). The ESI ID is publicly available, and all other required fields are not specific to that address.

Clearly, registration is a difficult issue to solve, as it requires the submission of private information to which only the owner of that address has access, apart from the REP of Record. As we see it, there is only one solution to make a truly secure registration process, which consequently is a much more convenient process than having to look up a meter number and a provider.

This alternate registration process would only require two address-specific fields:, the ESI ID, and a SMT Registration Code (SMTRC). The SMTRC would be a string of characters (much like the Account Authorization Code currently used on SMT) delivered privately to an address every month through the electric bill. In effect, this amounts to a non-private field (ESI ID) and a private field (SMTRC), which resembles the typical username/password archetype. The monthly electric bill is the best method for sending the SMTRC, as it is the most universal and secure method of delivery. In addition, it could be printed right next to the ESI ID to make the registration process even simpler for users.

In order to ensure that a person who previously resided at an address cannot create an account for that address using an old SMTRC, the code for an address would change whenever that resident moved out. Of course, even if a prior resident of an address could create an account for that address (which wouldn't be possible with SMTRC cycling), this is an improvement over the current process, as this is entirely possible with the ESI ID + meter number + provider approach.

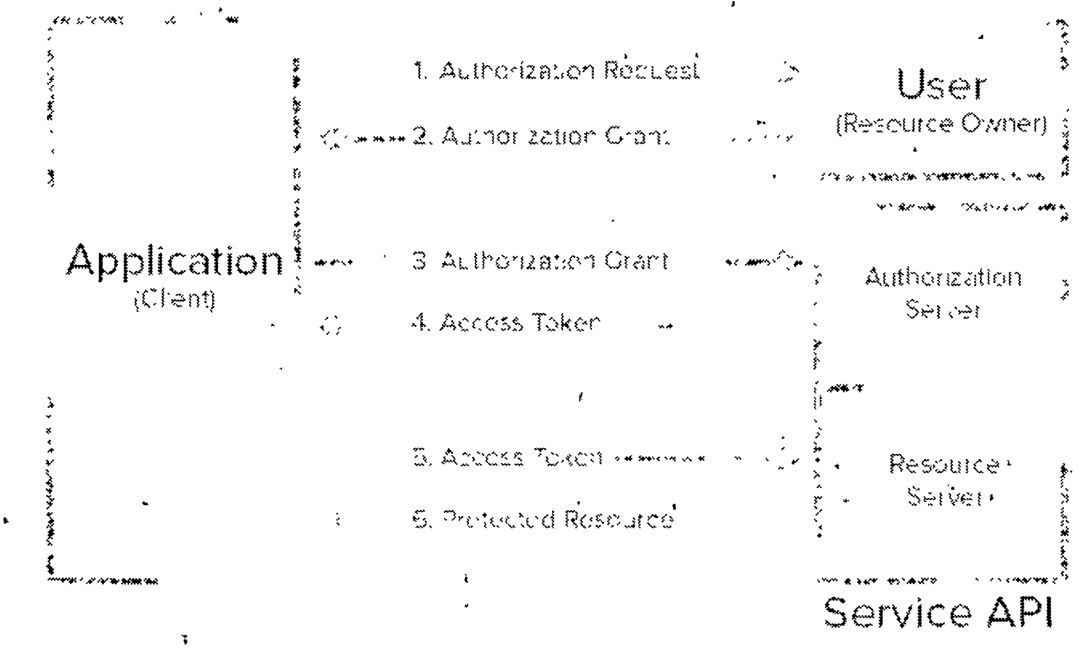
The difficulty of this approach lies in the initial implementation; a system will need to be put in place to distribute SMTRCs to REPs and making sure that electric bills include SMTRCs. However, the benefits in terms of security and ease of registration are entirely worth it.

C. Third Party Authorization

The third party authorization system is currently cumbersome and difficult to use (as described in Part I, Section C above), but an even more concerning issue is that it inherently introduces a data security flaw, which especially impacts the third parties that use automation to collect and assign usage data to users. Particularly, there is no built-in method to ensure that a user created in a third party's system should have access to an ESI ID's usage, since the third party requests are performed by ESI ID rather than by SMT user account.

Consider this example: a user creates an account on a third party website and provides the third party with his ESI ID. After establishing an agreement with the user, that third party makes a request to SMT using the user's ESI ID, but no other identifying fields. If ESI IDs were statically assigned to SMT users, this would work perfectly, but since users can move premises, this is not the case. With the ability to move, the onus of data security is on the third party. If that user moves out of their premises, they should no longer have access to the data associated with an ESI ID. This occurs on SMT by removing the meter from that SMT account. However, what if the person who moves into that same premises also creates an account with that third party? The third party will have to disallow the first user to make requests on behalf of that ESI ID. This is possible, but in a third party website with hundreds of thousands of users who can move at any moment, this can be difficult to maintain. Furthermore, this should not even be a requirement of the third party to manage in the first place.

The solution here is to associate usage data not with an ESI ID, but with a user. If this required building a protocol from the ground up, this would be a very difficult task. Fortunately, this has already been done and is used by a plethora of different websites in the form of OAuth 2.0. There are plenty of online descriptions of OAuth 2.0 that describe how it works in much better detail than we can afford here. However, in short OAuth 2.0 works by a user giving an authorization grant to an application, which that application uses to receive an access token from the service API (in this case, SMT). This logic is detailed in the graphic below:



OAuth 2.0 is a tried-and-tested method of providing data access to third parties, all while ensuring that the user is truly the resource owner. This is built into the protocol, so it does not rely on third parties to keep up with which users own which resources. OAuth is the protocol that is being used when an application allows users to "Use Facebook/Twitter/Google Login". This would be a similar implementation, providing user/premises information to the third party as well as usage data.

Using OAuth 2.0 in this manner would resolve the current security flaw in third party access, and would have huge benefits in terms of user experience. It is somewhat surprising SMT does not already use this approach.

D. Providing Data Access

SMT's main function is to provide data access to various parties, but it serves this function poorly. In this section, we outline how the API should function, and explain that SMT's servers should easily be able to handle requests for usage data with ease.

i. Providing Data Access: API

To be at all useful to third parties, the API should be entirely redesigned using REST architectural principles. Being based on an FTPS exchange, the current API comes with a plethora of security requirements for the third party, such as a client SSL certificate and PGP key. These security features are inherently included in a RESTful API, assuming the SMT system uses a valid SSL certificate for requests to the API.

A third party would be given a secret API key, which is the only thing the third party would need to make a request to the API. This secret API key would determine whether the third party has access to a particular resource. The API would utilize predictable, resource oriented URLs. Making API calls to predictable, resource oriented URLs should be the primary method of requesting usage. This meets all usage cases, as it allows for maximum flexibility so that clients can decide for themselves what they want to do with the response data. The API should be able to return the data in multiple formats, including JSON, XML, and CSV, at the client's request.

The current API is badly out of date, does not even work on a Mac, is slow and overly complex, and offers limited functionality. The API outlined above is none of these things, and would allow for more immediate responses when requesting usage data. Making requests to an endpoint ensures that the data will be returned predictably, rather than having to poll an FTPS endpoint, or wait several minutes on an email containing usage data. This is very important for automated third party apps, where a user expects instant feedback upon establishing an agreement. It also is simply the minimum that should be expected of a modern API.

ii. Providing Data Access: Server Configuration

The final issue we would like to mention is server capacity for handling requests for usage data. As discussed further above, if SMT receives a few hundred requests for usage data, these requests will go into a queue that will take hours. There is no reason for this whatsoever. Amazon Redshift can handle 500 concurrent requests, and each request will be lightning fast. Of course, there is still the issue of transferring the data from the SMT server to the client, but that is the easy part because the correct data has already been returned from the database. This could be handled by a simple Heroku app and the cost would be trivial.

III. Conclusion

The purpose of this report was to bring awareness to the fact that SMT is an out of date system that is deeply flawed and not built for purpose, and that the cost of SMT is excessive. SMT is far below the standard of what is expected of a modern data access system. The ideal system would cost less than what the TDUs are currently paying for SMT. As such, there is no justification for allowing the TDUs to pass the cost of SMT on to Texas electricity customers.